NOAA FISHERIES

Forensic Science

What is Forensics? *Forensic science is the application of scientific methods to answer questions within a legal setting. When any science is presented in a court of law, the level of scientific rigor must be higher and better documented than in regular research laboratory settings. The analysis of forensic evidence must be conducted with validated methods and absolute physical security to be admissible in court.*

Analysts subsample a whale vertebra for genetic analysis. NOAA Fisheries

The NWFSC Forensic Laboratory analyzes evidence collected during the investigation of civil and criminal violations of laws protecting marine species.

The NWFSC's Genetic and Evolution Program has an active Forensic Laboratory with strong expertise on both east and west coast species. The Forensic Laboratory maintains two facilities—one in Seattle, WA and one in Charleston, SC—to better serve all regions of the NOAA Fisheries Office of Law Enforcement (OLE). Together these laboratories have analyzed evidence for more than 700 civil and criminal investigations involving violations of the Lacey Act, the Endangered Species Act, the Marine Mammal Protection Act, and the Magnuson-Stevens Act, as well as international CITES violations.

Sperm whale tooth. NOAA Fisheries

NWFSC's Efforts Helps Protect Biological Resources and Seafood Consumers

NOAA Fisheries is responsible for the management of marine species in the United States, and the agency's regulations are often species- or stock-specific. The NWFSC's Forensic Laboratory identifies the origin of evidence items during OLE investigations to species, which helps law enforcement officials evaluate potential violations.

In addition to protecting our biological resources, the NOAA Fisheries Office of Law Enforcement protects consumer interests. Species substitution, or "seafood fraud," occurs when a restaurant, retail, or wholesale seafood business substitutes a species of low economic value for a species that has a higher market value. Illegal, unreported, and unregulated (IUU) fishing is a global problem that represents a major loss of resources and revenue for affected countries. The action plan recently released by the Presidential Task Force on Combating IUU Fishing and Seafood Fraud aims to strengthen law enforcement and provide a risk-based traceability program, both of which will be enhanced by forensic identification.

Juvenile fish to be identified via genetic analyses. NOAA Fisheries

Forensic Genetic Analysis is a Powerful Tool to Identify Species and Populations

An organism's DNA is contained in all its tissues, thus the identity of a species can be determined from a wide range of samples including fish fillets, processed seafood, dried tissue, fish scales, bone, claws, and blood. The NWFSC's forensic scientists can extract DNA from trace samples, such as tissue cells on a fish hook or a swab of dried blood, and from heavily processed material, such as canned meat. NWFSC scientists use DNA sequencing for species identification. NWFSC scientists develop genetic databases for identification of species and populations.

The Forensic Laboratory provides analyses in cases involving marine and anadramous fish, sea turtles, seals, whales, ivory, and shellfish. Forensic Laboratory scientists have procedures to maintain chain-of-custody with secure evidence storage, produce written reports of their work for law enforcement officials, and provide expert testimony for court trials. NWFSC's Forensic Laboratory also provides general biological consultation to Office of Law Enforcement agents, and when in-house analysis is not sufficient or appropriate for a case, the group can help locate the appropriate expertise or information.

Strategic Collaboration with NWFSC Research Staff and Partners

The Forensics Laboratory's strength the fact that both the Charleston and Seattle locations are part of larger research campuses. The Seattle facility has a long history of genetic monitoring of a wide variety of marine species, with 10 geneticists on staff, from whom the Forensic Laboratory can often request further research for Office of Law Enforcement needs. The Charleston laboratory is located on a campus with five marine research institutions and likewise has access to the expertise and scientific equipment from these laboratories to address enforcement needs.

As an example, the Forensic Laboratory works closely with scientists developing genetic stock identification methods to determine if an individual fish is from an endangered population. On the species level, forensic scientists collaborate with nearby institutions like the University of Washington and the Southeastern Regional Taxonomic Center to develop forensic voucher collections for species identification. The effort generates DNA sequence data that are linked to archived, expertly identified specimens. These data are submitted to Genbank, the largest public DNA sequence database, and/or the Barcode of Life Database.

On occasion, a law enforcement need will require additional biological or technical expertise beyond the in-house capabilities of the Forensic Laboratory, such as lipid analysis, pathology, disease diagnostics, nutritional analysis, toxicology, and microchemistry. The breadth of scientific expertise across NOAA Fisheries is considerable, and the Forensic Laboratory works with these agency colleagues to apply their specialties to unique enforcement issues and ensure rigorous forensic standards are followed.

In 2007, the NWFSC's Forensics Unit processed evidence in a case involving over 160,000 pounds of falsely labeled salmon with an estimated market value of $1.3 million. Office of Law Enforcement agents seized thousands of pounds of processed fillets, and the NWFSC's DNA analysis showed that a substantial portion of the product was misrepresented as a higher value species. The processor responsible for defrauding customers was fined over $300,000 and sentenced to a year in prison. NOAA Fisheries

A small carving identified as caribou antler (legal) and subsequently returned to its owner. NOAA Fisheries

Contact us

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Visit our Conservation Biology Forensic Group webage at: http://www.nwfsc.noaa.gov/research/divisions/cb/genetics/forensics.cfm

Juvenile fish stranded in a stream bed after water was re-routed for irrigation. NOAA Fisheries

Learn more:

Sharing our work with other scientists, with policymakers, and with the public is important to us. To learn more about what we do, please visit our:
Website: www.nwfsc.noaa.gov
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